

NON-PUBLIC?: N
ACCESSION #: 9003070116
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Susquehanna Steam Electric Station PAGE: 1 OF 4
Unit 2

DOCKET NUMBER: 05000388

TITLE: Unplanned ESF Actuation - Generator Load Reject and Reactor Scram
EVENT DATE: 02/06/90 LER #: 90-002-00 REPORT DATE: 03.02/90

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:
50.73(a)(20(iv))

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 0906 hours on February 6, 1990, with Unit 2 operating at 100% power, main generator power/load unbalance signal, created when the 500 KV switchyard main distribution breaker opened, caused a main turbine trip. In accordance with plant design, the turbine control valves closed and an automatic reactor scram occurred. All major equipment operated per design, the turbine control valves closed and an automatic reactor scram systems were not challenged and no abnormal operator actions were required to place the unit in a stable condition. The cause of this event was attributed to a loose "States" link in the differential current relay circuit of the 500 KV switchyard circuit breaker which connects Unit 2 to the Power Grid. High circuit resistance caused by the loose connection resulted in protective relay operation which opened the 500 KV circuit breaker, isolating the main generator from the Power Grid resulting in the power/load unbalance trip signal. The loose

"States" link was replaced and checks were made of the wiring terminations and "States" links on all related accessible relay and control panels to confirm that the connections are proper in order to preclude a recurrence.

END OF ABSTRACT

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DESCRIPTION OF EVENT

At 0906 hours on February 6, 1990, with Unit 2 operating at 100% power, a Main Generator (EIS Code: TB) power/load unbalance signal, created when the 500 KV Switchyard (EIS Code: FK) main distribution circuit breaker opened, resulted in a Main Turbine (EIS Code: TA) trip. Per design, the Turbine control valves closed and an automatic Reactor scram occurred. Both Reactor Recirculation (EIS Code: AD) pumps tripped per design via the EOC-RPT logic circuitry. All control rods inserted fully. Three Safety Relief Valves (EIS Code: SB) automatically lifted to control Reactor pressure and properly reseated. The immediate operator actions of EO-100-101, Reactor Scram, were performed. Reactor water level reached a minimum of +1 inch before recovering and all Reactor Level 3 automatic isolations functioned per design. All major equipment operated per design during the transient, Emergency Core Cooling Systems were not challenged and no abnormal operator actions were required to place the unit in stable condition.

CAUSE OF EVENT

The normal Susquehanna 500 KV Switchyard alignment has the Unit 2 Main Generator connected to the Power Grid via both the North bus and the South bus of the 500 KV Switchyard. At 0849 hours on February 6, 1990 the 500 KV circuit breaker connecting the South bus with the Power Grid) in order to perform preplanned maintenance work on a motor-operated load bank switch (which also ties into the South bus). As such, the Unit 2 Generator full load, for 17 minutes prior to the event, was directed solely through the North bus 500 KV circuit breaker. Following the Turbine trip and Reactor scram at 0906 on February 6, 1990, a switchyard investigation was initiated. A loose "States" link in the differential current relay circuit of the Unit 2 Generator North bus 500 KV breaker was found. This circuit was part of a switchyard modification which had been implemented during the 4th quarter of 1989. When the Generator full load was directed through the North bus 500 KV breaker at 0849 hours, the resulting increased secondary current flowing through the loose "States" link caused enough heating to increase the resistance of the circuit to the point where differential current relay operation occurred approximately 17 minutes later. This was evident by observed visible damage to the "States" link. The operation of the differential relay tripped the North bus 500 KV breaker which isolated the

Unit 2 Main Generator from the Power Grid, resulting in a power to load unbalance and the Main Turbine trip. A review of fault recorder data confirmed that no distribution system fault had occurred. Relay calibration checks confirmed that the relays had been correctly set and were operating properly. Thus, the cause of this event was attributed to the loose "States" link in the 500 KV

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circuit breaker differential current relay circuit which apparently had not been properly tightened following its installation.

REPORTABILITY/ANALYSIS

This event was determined reportable per 10CFR50.73(a)(2)(iv) in that an unplanned Engineer Safety Feature (ESF) actuation occurred when the Reactor Protection System (EIS Code: JC) initiated an automatic Reactor scram following Turbine control valve fast closure with power greater than 24%. All major equipment operated per design during the transient, Emergency Core Cooling Systems were not challenged and no abnormal operator actions were required to place the plant in a stable condition. The plant was safely shut down and there were no safety consequences or compromise to public health or safety during this incident, nor would there have been under different initial operating conditions. Generator Load Rejection is an analyzed event in the Final Safety Analysis Report, Chapter 15.

In accordance with the guidance provided in NUREG 1022 Supplement 1 Item 14.1, the required submission date for this report was determined to be 03/08/90.

CORRECTIVE ACTIONS

The loose "States" link was replaced. A comprehensive inspection of 500 KV Switchyard control wiring terminations and "States" links was performed in an effort to preclude a recurrence. This inspection included a visual inspection and tightening, as necessary, of terminations and "states" links in all relay and control panels, equipment panels, breaker cabinets, junction boxes and transformer control and mechanism cabinets. Excluded were cabinets containing high voltage or other related safety hazards. It is estimated that on the order of 100,000 terminations were inspected.

As a result of unplanned EST actuations caused by offsite switchyard/distribution problems, PP&L is planning to perform an in-depth review of the bulk power system at Susquehanna, including all aspects of its design, construction, operation and maintenance and how it can impact Susquehanna availability.

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ADDITIONAL INFORMATION

Failed Components Identification : Not Applicable

Previously Reported Events with similar results but with dissimilar causes:

Docket No. 50-388 LER 85-025 - Generator load reject, reactor scram.
Lightning strike on 500 KV line caused logic relay failure.

Docket No. 50-387 LER 84-034 - Generator load reject, reactor scram.
Phase-to-phase fault on 230 KV line (tree contact).

Docket No. 50-387 LER 88-006 - Generator load reject, reactor scram.
Worker bumped 230 KV yard span protection relay.

Docket No. 50-387 LER 88-010 - Generator load reject, reactor scram. Apparent
lightning strike on 500 KV line caused misoperation of ground fault relay.

Docket No. 50-387 LER 88-027 - Generator load reject, reactor scram. Loss
of electrical services to the 230 KV switchyard caused tripping of main
distribution breakers resulting in the generator load reject.

ATTACHMENT 1 TO 9003070116 PAGE 1 OF 1

Pennsylvania Power & Light Company
Two North Ninth Street Allentown, PA 18101 215/770-5151

March 2, 1990

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 90-002-00
FILE R41-2
PLAS -410

Docket No. 50-388
License No. NPF-22

Attached is Licensee Event Report 90-002-00. This report is being made
pursuant to 10CFR50.73(a)(2)(iv), in that Susquehanna Unit 2 experienced

an unplanned automatic actuation of an Engineered Safety Feature (ESF). The Reactor Protection System actuated upon a Turbine Control Valve Fast Closure resulting from a Main Generator Load Rejection. The Generator Load Rejection occurred when the 500 KV Switchyard main distribution circuit breaker opened, isolating the Main Generator from the Power Grid.

H.G. Stanley
Superintendent of Plant - Susquehanna

RRW/mjm

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